Scope of the Accelerator Reliability Workshop

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Accelerators and reliability

Along the years, evolution in the expression of target performances for accelerators

In the 60's figures of merit : Energy, current,.., costs, …
Accelerator major - important part of the experiment

In the 70's, introduction of new wording « factories »:
meson : LAMPF, SIN, TRIUMF, ..

Inspiring new notion of intensive and efficient production
Therefore high availability and reliability

Certain contradiction : reliability /accel development
always pushing performances to the limit
10s of μA to mA

Accelerators and reliability

SIN and LAMPF suffer from mini RF trips
several tens per day.

If all counted as Unscheduled Beam Interruption = fault
then number of UBIs per year in the 10 000 range

Later on, Synchrotron Radiation Light sources
« photon factories »

Large number of users for short periods to be scheduled Short lifetime of samples (biology)

High brilliance - Heat load on beamlines
Hours to recover sub-micronic positioning after UBIs

UNWANTED UBIs : a few 100s range
Reliability preferred to peak performance

Accelerators and reliability

Multi MW spallation sources will be next

Comparison with research reactors imposes
high demand on reliability and availability

ADS under discussion

Nuclear reactor driven by accelerator : safety aspects

A very few UBIs per year

Reliability demand pushed to the extreme

Could we further gain a factor 10-100 and build an accelerator for
~ or even < 10 UBIs per year ?

Medical applications are also demanding

Reliability and availability

Primary figure of merit for accelerators

Accelerators and reliability

Reliability (and availability)

as important as beam dynamics or technology developments

to be integrated in the early design

Totally relevant to have conferences and workshops
on the subject

Let us exchange experience
try and establish rules and procedures
encourage endurance tests on hardware and regular reports

Can we predict accurately reliability and design accordingly ?
Do we have the tools ?
Can we estimate impact on costs ?

Accelerators and reliability

Not easy task

Large variety of causes including human aspects

- Site (quality of electricity supply, etc.)
- Conventional facilities (cooling water, HVAC, etc.)
- Weak hardware components (RF, power supplies, …)
- Protection interlocks (too many wrong alarms)
- Control system (software and hardware problems)
- Secondary effects of not fully tested modifications (quality insurance)
- Qualification, permanent education and training of operators,
- Human mistakes (discipline)
- Systematic search for the causes, records and dispatch of information
- etc.